

RENEWABLE FUELS AND THE BIOECONOMY IN MICHIGAN II

THE CURRENT SITUATION – ETHANOL AND BIODIESEL

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The Current Situation – Ethanol And Biodiesel

The interest in and enthusiasm for renewable fuels continues at a fevered pitch.

From farmers who want to grow corn for ethanol production, to investors that see the potential for a quick return on their investment in renewable fuel plants, to consumers who view renewables as a substitute for foreign oil, ethanol has become the “issue of the day.” Not a day goes by without a new headline or news story about the promise of ethanol to reduce our dependency on foreign oil and boost our economy.

Bio-fuels such as ethanol help us diversify our fuel supply, strengthen our agriculture sector and create vital, good-paying jobs on our farms, in our research institutions and in our manufacturing sector. Private capital continues to flow to new ethanol-based companies, although there are signs that economic returns are not as attractive as they once were. And we're also starting to see some serious unintended consequences from the demand for corn as the basis of the fuels of the future— opening the door to a broader debate about non-corn bio-fuels in general.

THE CURRENT SITUATION: SUPPLY AND DEMAND

From the Thumb to Lenawee County to Southwest Michigan, ethanol plants are popping up everywhere.

The first ethanol plant was constructed in Michigan nearly 30 years ago in Alma. It operated for a short time, and never achieved commercial operation. It was soon abandoned, and ethanol production in Michigan didn't hit the news again until the year 2000, when a plant was located in Michigan's Thumb.

Two years ago, the company known as Michigan Ethanol began production in Caro, with a 36-million gallon per year (MGPY) production facility that operates today above “name-plate” capacity.

In 2006, two new plants started operations in Michigan: The Andersons, Inc. in Albion and U.S. BioEnergy in Woodbury, each with a 50-MGPY production facility.

Just this year, Global Ethanol in Riga began operations at their facility, and Marysville Ethanol is scheduled to begin production by year's end. Each plant has a capacity of 50-MGPY. In addition, both of these plants plan to double their capacity, making each a 100-MGPY plant.

Construction is underway at the Liberty Renewable Energy plant in Gratiot County, with a projected 116-MGPY production capacity. Construction is scheduled to start in the spring on NextGen's 50-MGPY Watervliet plant, and in the summer on their McBain 50-MGPY plant.

Another 100-MGPY plant has been announced for Corunna by the company E-85, which also announced nine other plants at various locations across the United States. The company has also applied for an air permit from the Department of Environmental Quality. There has also been discussion of additional 50-MGPY plants in both Manistee and Alma, and a 35-MGPY plant in Morrice.

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The ethanol industry in neighboring Ontario is also rapidly expanding, primarily because of a blending mandate -- a government requirement on ethanol content in gasoline -- sparking a boom of new plants. This will likely create additional demand for Michigan corn.

To highlight this growing demand, I've summarized current ethanol production, corn utilization, and plant status, in the following graph:

Plant	Millions of Gallons Per Year	Corn Demand; Millions of Bushels per Year
Operating Plants		
Caro	40	16
Albion	50	20
Woodbury	40	16
Riga	50	20
Total	180	72

Under Construction

Riga Expansion	50	20
Marysville	50	20
Liberty	116	48
Total	216	88

Plants That Have Applied for Air Permits

Watervleit	50	23
McBain	50	23
Corunna	116	48
Marysville (Expansion)	50	24
Total	266	118

Proposed Plants

Morrice	40	16
Manistee	50	20
Alma	50	20
Sarnia (Expansion)	50	20
Misc Ontario	50	20
Total	240	96

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GRAND TOTALS

	Millions of Gallons Per Year	Corn Demand; Millions of Bushels per Year
Operating Plants	180	72
Under Construction	216	88
Plants That Have Applied for Air Permits	266	118
Proposed Plants	240	96
Feed Demand		74
Grand Totals	902 MGPY	448 Million Bushels

2006 Total Michigan Corn Production for Grain 288.1 million bushels

2007 Projected Michigan Corn Production for Grain* 369.75 million bushels

*Based on 2.55 million acres, and an average yield of 145 bushels per acre

The annual demand for corn in Michigan for feed is estimated at 74 million bushels.

By the end of 2008, the demand for corn in Michigan for ethanol and feed will total between 220 and 240 million bushels. Any Ontario demand will add to that total.

Adding the demand for corn from the additional plants that have applied for air permits will boost total corn demand in Michigan to more than 350 million bushels by the end of 2009.

MABA predicts that in 2007, corn acreage may increase to 2.55 million acres, up from 2.2 million acres in 2006. That could yield a harvest of 369.75 million bushels of corn, up from 288 million bushels in 2006. That assumes an average yield of 145 bushels per acre.

It should be noted that some of these “new” acres may not be as productive as those currently used for corn, which may dampen the yield curve slightly.

Therefore, even with this increased acreage, Michigan producers will struggle to meet the new in-state demand for corn for ethanol production, with little left to meet traditional corn demand outside of Michigan, even though that out-of-state demand will not go away.

UNINTENDED CONSEQUENCES

The battle for corn to fuel the burgeoning ethanol industry is roaring all across the country. With 42 new ethanol plants and seven expansions currently under construction, U.S. ethanol production capacity will increase by 3 billion gallons in the next few months. With 300 additional proposals to build more ethanol plants across the country, the total capacity could hit 20 billion gallons in the next three or four years.

The most significant impact of the new corn demand and higher corn prices is the dramatically rising feed cost for livestock, poultry and dairy. That means more expensive chicken, turkey and

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beef for consumers. Prices for virtually every other crop have also risen -- from asparagus to soybeans and wheat to cucumbers. These higher crop prices have occurred as the competition for acres, as defined by net return per acre to a farmer, has become more intense.

As an example, Mexican customers of black beans from Michigan have stepped up with their offers for beans from last year's level of roughly \$18 per hundredweight to the current grower price of \$28 per hundredweight to ensure that they have supplies of high quality Michigan black beans to meet their market needs. If they had not done this, dry bean acreage would have been reduced in response to the demand for corn.

With this new and expanding, in-state demand for corn, the amount of corn that is moved during harvest must be reduced significantly, with the bulk of the harvest kept here. That will require considerably more grain storage. Commercial handlers have already added storage, as will every ethanol facility, and growers.

Another, less obvious development involves the issue of crop rotations, and the effect of reduced crop rotation on other industries. If soybean and dry bean planted acreage falls, the acreage available for fall wheat planting will also be reduced. That would put pressure on acres available for soft white winter wheat, a specialty wheat type produced mainly in Michigan and the surrounding region for the cereal industry.

Kellogg and other cereal companies have already expressed concern about this situation, as have canners of navy beans around the world with the potential lower production of navy beans in Michigan.

In addition, for example, a reduction in dry bean acres will push more of that demand toward foreign producers (primarily China and possibly Ethiopia), ultimately reducing cropping options, and perhaps eliminating the option of producing some of the traditional specialty crops grown in Michigan.

Finally, rail traffic could fall dramatically in the rural areas of the state without corn movement outbound. That could mean less revenue for rail operators and may mean lower maintenance expenditures, and eventual degradation and possible abandonment of rural railroad lines. The impact of this on the economics of other crops and the movement of crop production inputs, especially fertilizer to rural areas could be profound.

Clearly the greatest impact on the transportation sector will be on truck traffic and availability. MABA estimates that the demand for truck transportation to move corn to ethanol plants, DDGs to users and ethanol itself to blenders will require the truck fleet servicing agriculture to double in the next 24 months.

The impact of more trucks on highways, and especially local roads will be an issue, but even more difficult will be the task of finding people to drive trucks in the numbers that will be required to meet the explosion in demand.

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The challenge will be whether Congressional and legislative leaders are prepared for these eventualities, and willing to stay the course to encourage the renewable fuels industries.

CURRENT SITUATION – BIODIESEL

We should briefly mention the status of bio-diesel in Michigan. There are currently two bio-diesel plants operating in Michigan, Ag Solutions in Gladstone and Michigan Biodiesel in Bangor.

While there are several other bio-diesel plants in various stages of development, the major issue confronting all the bio-diesel efforts is the supply of “blendable” oil. Whether used in cooking oil, animal fats (from rendering operations) or soybean, canola or other commercially produced oils, demand will soon exceed supply.

There are proposals to build additional soybean-crushing facilities with the goal of creating additional oil for blending. The challenge is that the other major product from this process is soybean meal, most of which is fed to livestock.

Creating additional livestock feed without the accompanying will to expand livestock production creates a glut of feed without a market. Increasing beef and dairy production could consume both DDG’s and soybean meal locally.

Also, while “virgin” soybean oil is highlighted as the most likely source of oil for blending, there are alternative crops that produce more desirable oil.

In simple agronomic terms, canola may be better suited for this opportunity than other crops that produce a lower yield of oil, or simply cannot be grown in northern climates. Canola can be produced here, and the industry is in the midst of rapid expansion in many western states and Canadian provinces.

Other challenges facing this industry, in addition to the availability of blendable oils, include the comparatively low technology requirements and low investment required to locate, build and commercialize a blending facility.

FUTURE DEVELOPMENT

It appears that the future opportunity for development in the ethanol industry is two-fold:

First and perhaps the most pressing need is to ensure that existing corn-based ethanol plants and those under construction are sustainable. Specifically, we must make sure that the plants we have in Michigan are encouraged to embrace the latest technology and update their processes to incorporate the best, most efficient production practices.

Some of the latest advances include new and advanced enzymes, and “fractionating,” or removing the germ from a kernel of corn. We must support other ethanol and bio-diesel

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production improvements like retro-fitting or adding new, advanced technologies to existing plants to ensure these plants can succeed and are sustainable in the future.

Rather than give incentives to build more plants, making sure those we have continue to be successful is critical given the investment and original commitment to these plants.

The second and most important strategy for the future of renewable fuels is the development of cellulosic ethanol production.

The competition in both the private sector and academic communities for the commercialization of cellulosic ethanol production has been highlighted of late by President Bush who has been holding events weekly since his State of the Union speech focused on cellulosic ethanol production.

There are essentially four broad technologies used in cellulosic ethanol production; dilute acid, steam explosion, dilute ammonia and ammonia fiber expansion.

Companies including Broin, DuPont, Abengoa, Iogen and others are pursuing their own cellulosic development plans, and have plants under construction using one of the technologies outlined above.

While there are currently no facilities under construction in this state, there is tremendous interest, and even a wealth of intellectual property (research discoveries) housed here, in particular at Michigan State University.

For the cellulosic ethanol industry to settle here, in Michigan, there are several issues that need to be addressed.

First is the need to locate a cellulosic research facility in Michigan. Many believe that a research “biorefinery” adjacent to the Michigan Biotechnology Institute would allow both facilities to take advantage of each others’ infrastructure, success and intellectual property.

The second issue that will drive cellulosic ethanol production is deciding what kind of raw material or biomass will be used as the feedstock for the plants. The options range from corn fodder to wheat straw and woody material to switchgrass. The Department of Energy (DOE) has prepared a report that analyzes various biomass sources, the quantities that can be produced and rough cost estimates. The link for that is: feedstockreview.ornl.gov

According to projections, a billion tons of biomass will produce enough ethanol to replace at least 30 percent of the petroleum-based fuel that the United States consumes. The DOE study also says that the largest single source of biomass in the United States is wood fiber. Forestlands in the 48 states, the report says, can produce 368 million dry tons of biomass annually. In addition, agricultural lands could contribute 194 million tons of dry biomass, assuming that 40 percent of crop residue such as corn stover (stalks, husks, etc.) was collected. Corn stover alone could account for as much as 75 million tons of biomass.

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Additional sources of biomass include wheat straw (11 million tons), other crop residues (21 million tons), manures (35 million tons), and other residues (62 million tons) and could account for another 119 million tons. Even at a relatively low conversion rate of 60 gallons per dry ton, this material could provide an additional 11.6 billion gallons of ethanol.

The greatest challenge for the future development of cellulosic ethanol production (beyond harnessing the technology) is the creation of the infrastructure and industries to gather, process, treat, store and deliver biomass to the production plant. This will require tremendous leadership and commitment.

Some contend that there will need to be several gathering facilities to accumulate the biomass, store and process the material and then deliver it to the production facility on schedule, most likely by truck or rail.

The fundamental question however is what will be the actual biomass source. While the discussion generally highlights the grasses such as switchgrass, etc., there is really very little knowledge about their production. There is little understanding about the fertility requirements, varieties, genetic enhancement opportunities, weed control issues, insect pressures, or even diseases related to these grasses.

Woody biomass is another option. However, it is generally agreed that the processes necessary to use this biomass source as a raw material are more difficult than other sources.

On the other hand, there is a considerable body of existing work on corn and wheat. Genetic companies have expressed confidence that they can double corn grain yields in the next decade or two, and ensure that the corn plant produces biomass for that form of ethanol production. Some wheat variety breeders are also moving in the same direction. They are seeking higher grain yields and straw that can produce renewable fuels.

There are also questions about the long-term impact of harvesting cellulosic material from fields on soil structure and nutrient levels. This is an area where additional research is necessary, again from an agronomic perspective.

BEYOND ETHANOL AND BIODIESEL

While there is tremendous interest in renewable fuels, there is also growing attention being paid to the broader use of fermentation processes of bio-mass for the production of fine chemicals, polymers, and other materials for virtually every segment of industry that currently uses petroleum as a feedstock.

Manufacturing companies are expressing the need for consistent, reliable and price stable raw materials for their manufacturing processes. They view renewable, bio-based material as a stable and predictable option for their business.

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From automotive applications to fibers for carpet, and clothing and other uses, including furniture and building materials, bio-materials are receiving attention from many different sectors.

While mostly in the research and development phase, bio-based materials hold tremendous potential for economic activity. Challenges remain regarding the feedstock, process and products with the greatest potential.

FUTURE

We believe there will be a second generation of ethanol production that will transcend corn and involve biomass. The future success of biodiesel probably lies with the use of other, new sources of oil being commercially developed. The bio-based economy, in total, will thrive!

Another issue that needs considerable research attention involves the use of DDGs as feed. This issue is not as simplistic as just allowing more livestock, dairy and poultry production, but also involves developing a better understanding of rations including DDGs for every species, and maintaining the quality of the production of each system (butter fat for milk, firmness in pork, etc.).

The quantity of DDGs that will be available in the next few months will require their use, and the bank of knowledge is nowhere near where it should be. A database of relevant information must be developed to encourage idea-sharing, best practices, etc.

POLICY

With all this on the horizon, especially with the euphoria surrounding the bio-based economy, there is a window of opportunity, and at the same time a tremendous void of focus to place Michigan at the forefront of these exciting new industries.

Becoming a leader in the bio-economy and a hub for research in the renewable fuel sector are critical facets to move Michigan's economy forward. The creation and utilization of a skilled workforce, commercializing discoveries from major universities and partnering with the private-sector manufacturing and agricultural industries could provide huge long-term benefits to our state.

But we can't miss the boat.

Policies at the state and local level should position Michigan as a national leader in the bio-economy, with work centered in the following areas:

- Define renewable energy resources (wind, solar, ethanol, bio-diesel, hydro, etc.);
- Create a system of tax credits for companies that commercialize Michigan-based research and discoveries and which locate in Michigan;

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- Build a “bio-refinery” research facility with a bio-stock (bio-mass) nursery, bio-refinery, incubators for startup companies associated with the industry; and
- Create a cabinet-level Task Force within the Governor’s Office on the bio-based economy to coordinate state policy and development efforts for renewable fuels and the bio-based economy.

RESEARCH AND TECHNOLOGY

- Create a nursery of biomass crops, in cooperation with the private sector, to evaluate their potential in Michigan;
- Construct a “laboratory style” bio-refinery for researchers, the private sector and others to use as a test facility for various projects related to renewable fuel and bio-based research; and
- Create a tax credit for bio-based research and development companies.

COMMERCIALIZATION

- Focus renewable fuels renaissance zones on the location of cellulosic production facilities;
- Allow startup/entrepreneurial companies to sell their loss, carry forward tax credits and net operating losses to help fund their enterprises;
- Allow the transfer or sale of tax credits from the new bio-based industries to other companies to generate revenue for the startup company; and
- Create an incentive program to encourage companies to build bio-mass gathering and handling facilities to support cellulosic opportunities.

LEADERSHIP

- Develop a strategy that will include state government, federal stakeholders, researchers and the private sector, with appropriate incentives and policy to enhance the technology and processes in existing Michigan-based ethanol plants and facilitate the development of the cellulosic gathering and processing industries, and cellulosic ethanol production
- Create a comprehensive database of information about bio-mass, renewable fuels, the bio-economy, and other relevant information as a resource for Michigan companies, industries and investors
- Create a special tax incentive for existing ethanol plants (that are operating by a date certain) to encourage the addition of new technologies to help maintain their economic viability

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- Develop tax incentives to locate biomass/cellulosic ethanol plants in Michigan and
- Create a “bio-bond” to help finance start-up and expanding businesses that are becoming active in the bio-economy

SUMMARY

The opportunities for renewable fuels and the bioeconomy in Michigan are literally boundless. The economic activity being experienced in agriculture is delivering record income to Michigan farmers, and the prospects for the future are just as bright.

One of our serious challenges is to make sure that these new corn-based ethanol plants continue to be successful and profitable. That will require a new effort to encourage them to add new and improved technology to their operations.

Cellulosic ethanol presents a whole different set of challenges and opportunities: From determining the bio-mass source, to establishing the new businesses to gather, handle and process that material, coupled with the construction and development of plants and technology, we are in uncharted territory.

Michigan can be a leader in this new development, but there must be a coordinated, well-defined, long-term strategy to harness all the various resources, institutions and companies interested in the total endeavor.

This is a very competitive situation, however.

Indiana has just announced an aggressive program focused on cellulosic development, and Iowa already has a cellulosic plant being built there by Pioneer/Broin/DuPont.

The emerging bio-economy is crucial in our efforts to become an economic leader in a global 21st Century world. Michigan is in a strong position to build a vibrant bio-economy, which can help us create good-paying jobs today and in the future.

For Michigan to be successful in this effort, and avoid being left behind, we must energize now!